

REMARKS

Claims 29-55 are presently in the application. Claims 1-28 and 56 have been canceled.

The drawings have been objected to as failing to illustrate the “piezoelectric actuator disposed outside the hollow body” (claim 56). Claim 56 has been canceled.

Claim 29 has been rejected under 35 U.S.C. 102(a) as being anticipated by Jovovic et al. (WO 03/033933A1). Applicants’ attorney has used Jovovic et al. (US 7,222,424), the US equivalent of WO 03/033933A1, for an understanding of WO 03/033933A1. All references to columns and lines in Jovovic found in the following remarks refers to Jovovic et al. (US 7,222,424).

Jovovic teaches an actuator unit (1) comprising a piezoelectric actuator element (2) which is arranged in a thin-walled cylindrical hollow body. The hollow body is elastically embodied and pre-tensions the actuator element (2). Jovovic further teaches that the hollow body is a solid-drawn steel tube which is provided with a plurality of longish recesses (14). See, Abstract. Jovovic emphasizes throughout his specification and claims that the tubular spring (12) is formed from a seamless drawn steel tube having no longitudinal joint or weld. For example, col. 4, ll. 4-9, teaches the following:

The use of seamless drawn steel tubes allows improved dimensional stability of the required cylindrical outline of the tubular spring. As there is no longitudinal weld, as is necessary in the case of known methods, fewer potential defects are produced in the metal. In addition, the usually necessary weld machining can be omitted.

Thus, the examiner’s finding that Jovovic discloses an actuator unit (1) having an elongated body (12) “having a joint (not shown) extending parallel to its longitudinal axis”

Appl. No. 10/538,033
Amdt. dated March 11, 2008
Reply to Office action of December 11, 2007

(rejection, p. 3) is erroneous. Not only is no joint shown in the reference (which even the examiner acknowledges), but the teachings in the reference clearly emphasize that there is no longitudinal weld in the tubular spring taught by Jovovic.

Claim 29 is directed to an actuator unit having an elongated hollow body with a joint extending parallel to its longitudinal axis and a plurality of recesses, the recesses adjacent to the joint being smaller than the rest of the recesses.

To support a rejection of a claim under 35 U.S.C. 102(b), it must be shown that each element of the claim is found, either expressly described or under principles of inherency, in a single prior art reference. See Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 772, 218 USPQ 781, 789 (Fed. Cir. 1983), cert. denied, 465 U.S. 1026 (1984).

There is clearly no teaching in Jovovic of an actuator unit having an elongated hollow body with a joint extending parallel to its longitudinal axis and a plurality of recesses, the recesses adjacent to the joint being smaller than the rest of the recesses. Thus, Jovovic does not anticipate claim 29.

Claims 30-55 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Jovovic et al. in view of Frank (US 6,681,462).

Independent claim 30 is directed to an actuator unit comprising an elongated hollow body (4) having a longitudinal axis (35) and a piezoelectric actuator (1), the hollow body (4) being elastically embodied and prestressing the actuator (1), the hollow body (4) having a plurality of recesses distributed thereover with bridge pieces between adjacent recesses, and having a joint (31) extending parallel to its longitudinal axis (35) with a bridge piece (19) between each pair of adjacent recesses (7, 7a, 7b), the bridge piece (19.1) between a recess (7a,

7b) adjacent to the joint (31) and another recess (7) adjacent to that recess being wider than the bridge pieces (19.2) between the rest of the recesses (7).

The examiner cites Frank for a teaching that the shape and dimensions of the recesses could be modified to meet the specific requirements of the application (rejection, p. 4). However, there is no specific teaching in Frank of the bridge piece between a recess adjacent to the joint and another recess adjacent to that recess being wider than the bridge pieces between the rest of the recesses.

As disclosed in applicants' specification, the welding of the joint has a number of disadvantages: the welding causes a generally undesirable structural change to the hollow body in the immediate vicinity of the welding seam; spatters are produced during the welding, which can lead to difficulties in assembly of the actuator unit or can even lead to functional failures of the fuel injection valve when one or more spatters come loose during operation; and a sinking-in of the welding seam (seam sinkage) at the beginning and end of the welding seam and the resulting notch effect and voltage spikes.

In order to overcome these disadvantages, applicants' claimed invention includes recesses and bridge pieces adjacent to the joint, wherein the bridge pieces in the region of the joint are wider than in the rest of the blank. This serves to intentionally reinforce the hollow body in the regions in the immediate vicinity of the joint so as to compensate for the reduction in the spring rate in the region of the joint. It is therefore possible to achieve a spring rate of the hollow body that is constant and/or rotationally symmetrical over its entire circumference so that the piezoelectric actuator that the spring force of the hollow body acts on is loaded with forces exclusively in the axial direction and not with lateral forces or bending moments. This can

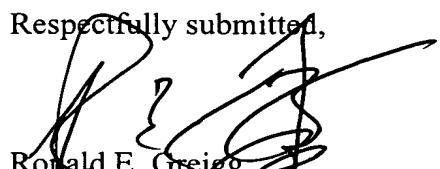
Appl. No. 10/538,033
Amdt. dated March 11, 2008
Reply to Office action of December 11, 2007

significantly extend the service life of actuator units equipped with a hollow body according to the present invention. There is no recognition in either Frank or Jovovic et al. of the problems solved by the applicants' claimed invention and certainly no teaching or suggestion in either reference of applicants' claimed solution.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) and MPEP 2143.03. Neither Jovovic et al. nor Frank teaches or suggests an actuator unit of the type recited in claims 30-55 having an elongated hollow body having a joint extending parallel to its longitudinal axis with a bridge piece between each pair of adjacent recesses, the bridge piece between a recess adjacent to the joint and another recess adjacent to that recess being wider than the bridge pieces between the rest of the recesses. Accordingly, claims 30-55 are not rendered obvious by the combined teachings of Jovovic et al. and Frank.

Entry of the amendment and allowance of the application are respectfully requested.

Respectfully submitted,



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